MBWR-32 Equations of State for n-Octane and Decane and Extension of the Multi-fluid Corresponding States Model for Natural Gas Properties

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The accurate description of mixtures includes both single-phase (bulk) properties and the description of phase equilibrium boundaries. In order to estimate these properties, many variants of corresponding-states theory have been developed, especially for nonpolar mixtures such as those found in natural gas systems.
In this work we have developed new, modified BWR equations of state for n-octane and n-decane. These equations of state cover a wide-range of temperatures and pressures and are currently the most accurate equations of state available for these fluids. The new equations of state, along with equations of state developed previously for lighter hydro-carbons, have been used to reformulate the Lee-Kesler-Teja multi-fluid corresponding states (MFCSP) model to incorporate a second order correction for the acentric factor. In addition, the second order MFCSP model has been used to generate an optimal reference fluid for use in the extended corresponding states model with shape factors. Both of the extended models have been tested on bulk-phase properties of systems containing methane through decane, in both the pure and mixed states. Results are also compared to those obtained using the original Lee-Kesler model and those obtained with the original extended corresponding-states model that incorporates a single propane reference fluid